Production and consumption of basic agricultural products in Ukraine as a basis for food fund formation

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Abstract. This paper researches the regularities of change in levels of production of basic kinds of agricultural products. Forecast estimations are presented. Comparison of the efficiency of basic agricultural products production in Ukraine, the United States and Hungary is suggested. Consumption funds of basic food products and standards of their consumption in Ukraine are studied. The level of self-sufficiency of basic food types in Ukraine is determined. On the basis of the conducted study the forecast of production of basic products for providing nutrition standards is suggested.

Keywords: food provision, food production, food consumption, nutrition standards, food security.

Introduction. Sufficient food provision of the country is of strategic importance as it determines not only food security, but national security as well. For Ukrainians the problem of food security has a particular meaning, which is connected with the events of their life in the twentieth century when they experienced several revolutions, wars, famine in the 30's and 40's, queues for food in the 80's, radioactive contamination of large areas of the country due to Chernobyl disaster, the lack of adequate nutrition among the most part of the population because of poverty in the 90s.

The need for ensuring food security in Ukraine requires maintaining an appropriate level of the self-sufficiency of food, which presupposes the use of state support of domestic agricultural producers and control measures of imported products in order to protect domestic producers from foreign competition. Reliability of ensuring food security lies both in proper self-sufficiency of food and in funds for their import in proper amount under the conditions of minimum potential vulnerability of food security of population in

case of complications with food imports (lack of currency, increase of prices, embargoes, etc.).

Issues of food security came into the view of the national economic science not long ago. The factor of emergence and permanent increase of attention to these problems is transformational crisis of Ukrainian economy, which covered all fields and became a significant obstacle to sustainable development of economy and society. Therefore, the problem of determining the level of food security, ensuring development of agro-industrial complex (AIC) can be considered as one of the most important national priorities that requires more attention of scientists, systematization and conceptualization of this concept as a scientific category.

The fundamental works of scientists in this field, such as V. Berehovyi, V. Vlasov, Ya. Zhalilo, Yu. Luzan, I. Mytsenko, V. Rusan, P. Sabluk, O. Sobkevych, A. Yurchenko et al. [1-6], formed the main ways of the estimation and methodology of the calculation of influence of various factors shaping food security of the country on agriculture development, but the problem of management of the development of agriculture and AIC economics on forecast levels of food security has not been fully studied yet. Therefore, the purpose of this study is, on the basis of modern economic analysis, to use the most precise, accurate and low-cost methods of forecasting certain indicators of economic development of AIC for increasing the efficiency of management of development of AIC economics.

The object of the present study is the methodology of estimation and analysis of influence of some factors on the possibilities of ensuring food security of Ukraine.

The aim of the study is to conduct the research of processes and methods of prediction of certain parameters and defining the nature of the influence of the factors of AIC economic development, depending on the length of the forecast period in conditions of indistinct or insufficient information and sharply

changed demand ranges for stabilization of food security of the country, the choice of the list of indicators and criteria.

Scope and Methods. General methodological basis of the research is fundamental propositions of modern economic theory, works of leading Ukrainian and foreign scientists on the issues of food security, regulatory acts in economic, environmental and recreational activity in Ukraine and other countries. Informational basis of the research involves the works of Ukrainian and foreign experts devoted to economic activity in the agro-industrial sector, statistical reports of State Statistics Service, various ministries and departments, author's own researches. To achieve the research aim the present study applies: the principle of scientific objectivity; methods of analysis, synthesis, with the wide use of comparative and problem analysis; methods of mathematical statistics, forecasting.

Results. The analysis of regularities of change in production levels of basic agricultural products (Table. 1) indicates rather diverse trends prevailing in 1995-2012. For example, grain and grain legumes production during this period increased by 36.3% or by 12.3 million tons, which means that annual growth was about 1.84% or 0.72 million tons. It should also be noted that grain crops yield during this period was quite low, and in 2012 did not even reach the level of 1990. With retaining defined tendencies, ie with retaining arable area and productivity, according to forecast estimations production capacity can reach 58.8 million tons in 2015 and 71.5 million tons in 2018 (Table. 2).

For the last 17 years sugar beet production has decreased by 38.05 %, or by 11.3 million tons, herewith it should be mentioned that since 2009 the tendency of increase in production levels has been formed, which resulted in rather optimistic forecast estimations. For example, according to calculations on the basis of relevant trend models, sugar beet production can reach 27.3 million tons in 2015, and 33.8 million tons in 2018. Potatoes production for the last 15 years has quite clear positive trend, specifically, average annual growth rates

comprise 104.1 %, and for the entire period production levels nearly doubled. According to the forecast estimations, with retaining defined conditions till 2015 production levels can be as high as 27.3 million tons, and reach 31.3 million tons in 2018. At the same time, changes in production levels of vegetables and gourds, with the general tendency to grow, have significantly lower intensity as average annual growth rate was only 2.6 %, which means that annually for 1995 - 2012 absolute increase was at 0.212 million tons of potatoes. Forecast estimations of future production levels of vegetables and gourds make up 11.2 million tons in 2015, and 13.5 million tons in 2018.

Table 1.

Production dynamics of basic agricultural products in Ukraine and their productivity in 1995-2012 [7]

Years	S_H million persons	The area of arable land, million. hectares	Grain and grain legumes productivity	Agricultural production index (2004-2006)100%	Grains and legumes production, million tons	Sugar beet, million tons	Sugar beet productivity	Potato production, million tons	Potato productivity	Vegetables and gourds production, million tons	Vegetables and gourds productivity	Vineland area, million hectares	Productivity
1990	51.9	33.6	35.1	156.2	51	44.3	275.7	16.7	116.8	7.5	133.5	3.7	45.4
1995	51.5	33.3	24.3	101.6	33.9	29.7	204.7	14.7	36.2	6.4	110.3	2.4	30.4
2000	49.2	32.6	19.4	83.4	24.5	13.2	176.7	19.8	121.6	6.2	102.8	2	41.2
2005	47.1	32.5	26	99.2	38	15.5	248.2	19.5	128.4	7.6	147.9	2.1	61.6
2009	46.1	32.5	29.8	109.3	46	10.1	314.9	19.7	139.3	9	166.8	2.1	69.6
2010	45.9	32.5	26.9	107.6	39.3	13.7	279.5	18.7	132.5	8.9	161.4	2.2	74.1
2011	45.7	32.5	37	129.1	56.7	18.7	363.3	24.2	168	10.6	180.3	2.4	82.7
2012	45.5		31.2		46.2	18.4	411.1	23.2	161	10	182.7	2	89.9

Table 2.

Forecast estimations of the production of basic agricultural products, million tons

Year	Forecast production levels				
	Grains and legumes	Sugar beet	Potatoes	Vegetables and gourds	Fruits, berries and grapes
2012(fact)	46.2	18.4	23.2	10	2
Forecast 2015	58.8	23.7	27.3	11.2	2.27
2018	71.5	33.8	31.3	13.47	2.5

At the same time fruits and berries production for 1995 - 2012 decreased annually by 1.1 %, and for the whole period the decrease was 17 % or 0.40 million tons.

According to forecast estimations, a slight increase in production of these crops can be expected, but even under these conditions they can reach the levels of 1995 only by 2017-2018.

With the exception of poultry industry development there is a rather negative trend of decrease of both livestock number and production in certain branches of livestock sector. The highest intensity of decrease was in cattle number as annual decrease for the last 17 years averaged 0.77 million heads or 7.7 %. The number of pigs annually decreased by 0.337 million heads, or on average by 4 %, the number of sheep and goats decreased by 0.139 million heads or about 5 % on average every year from 1995 to 2012.

The dynamics of changes in livestock production levels for the period concerned was rather diverse in tendencies (Table 3).

Table 3.

Production of basic livestock products in Ukraine in 1995 - 2012 [7]

Year	Livestock, million. heads				Production		
	Cattle	Pigs	Sheep and goats	Poultry	Meat, million tons	Milk, million tons	Eggs, million pieces
1995	17.6	13.1	4.1	149.7	2.3	17.3	13926
2000	9.4	7.7	1.9	123.7	1.7	12.7	8808.6
2005	6.5	7.1	1.6	162	1.6	13.7	13046
2009	4.8	7.6	1.8	191.4	1.9	11.6	15907.5
2010	4.5	8	1.7	203.8	2.1	11.2	17052.3
2011	4.5	7.96	1.73	202.1	2.143	11.1	18689.8
2012	4.4	7.37	1.74	207.3	2.21	11.4	19110.5
Average annual growth rate (decrease),%	92.3	96.07	95.08	101.9	99.8	97.6	101.9
The average absolute growth (decrease)	-0.77	-0.337	-0.139	3.39	-0.0053	-0.347	305

Approximately the same rate was registered in decrease of milk production levels, comprising on average 2.4 %, which indicates a rather low productivity of cows. At the same time, the fall in meat production has a much lower rate than in the total livestock number, that is 0.2 % per year, which indicates the improvement of pigs productivity. Only poultry in the country developed rather rapidly as for the last 17 years both poultry number and eggs production increased by more than 37 %, ie the corresponding rates increased annually by 1.9 %.

According to forecast estimations, with retaining tendencies (Table. 4) prevailing in Ukraine for the last 17 years, cattle number can decrease significantly. By 2018 this reduction will be nearly 0.8 million heads compared to 2012, which will be accompanied by decrease in milk production. For example, this production level can reach 11.09 million tons in 2015, and 10.81 million tons in 2018, which is 0.6 million tons less than in 2012. Pigs number can remain near 2012 levels, but only under conditions of productivity growth, meat production can reach 3.121 million tons in 2018, which is 0.911 million tons more than in 2012. Sheep and goats number will decrease in the future and can reach, for example in 2018, the number of 1.645 million heads, which is 0.095 million heads less than the level of 2012. Only the development of poultry industry will preserve a positive trend: poultry number, according to forecast estimations, can reach 286.7 million heads in 2012, and eggs production will increase to 30.4485 billion pieces, which is almost 60 % more than in 2012.

Table 4.

Forecast estimations of production of basic livestock products.

Year	Livestock, million. heads				Production		
	Cattle	Pigs	Sheep and goats	Poultry	Meat, million tons	Milk, million tons	Eggs, million pieces
2012(fact)	4.4	7.37	1.74	207.3	2.21	11.4	19110.5
Forecast for 2015	4.23	7.76	1.676	241.8	2.494	11.09	23718.1
2018	3.6	7.63	1.645	286.7	3.121	10.81	30448.5

Changes in production level today must be primarily caused by productivity growth among basic types of agricultural products. At the same time, among the majority of these types their rates in Ukraine are much lower than in some countries of the world (Table. 5). For comparison, two countries were chosen: the United States as one of the highly developed countries, and Hungary, as a traditional agricultural country in Europe from the former socialist camp.

Table 5.

Comparison of production productivity of basic agricultural products (as of 2011) [7]

Country	Yields, dt/ha					Milk yield from 1 cow, kg per year
	Grains and legumes	Sugar beet	Potatoes	Vegetables and gourds	Fruits, berries and grapes	
Ukraine	37	363.6	168	180.3	82.7	4174
the USA	67.5	532.7	421.7	322.2	293.2	9678
Hungary	50.8	570.7	285.7	195.3	62.8	5542

As the presented rates show, in comparison with the United States in all basic types of agricultural production productivity in Ukraine is lower by a huge ratio, a significant underrun from Hungary rates can also be stated with the exception of fruits, berries and grapes yield.

Taking into account presented correlations, providing the growth of level of agricultural production as the main factor of ensuring food security is connected mainly with productivity growth, ie via the intensification of agriculture development in the country.

Food security is caused not only by production levels of basic types of agricultural products but also by consumption of the basic food products and relative consumption balances.

Consumption funds are defined with the balance method and include the amount of food products, use of the population for personal consumption in any

form. They consist of the production in the report year, imported products, and also products of the previous years in the form of consumed assets.

Today the level of self-sufficiency with the basic types of food, which is described by the ratio of production to domestic use in Ukraine is characterized as follows (Fig. 1).

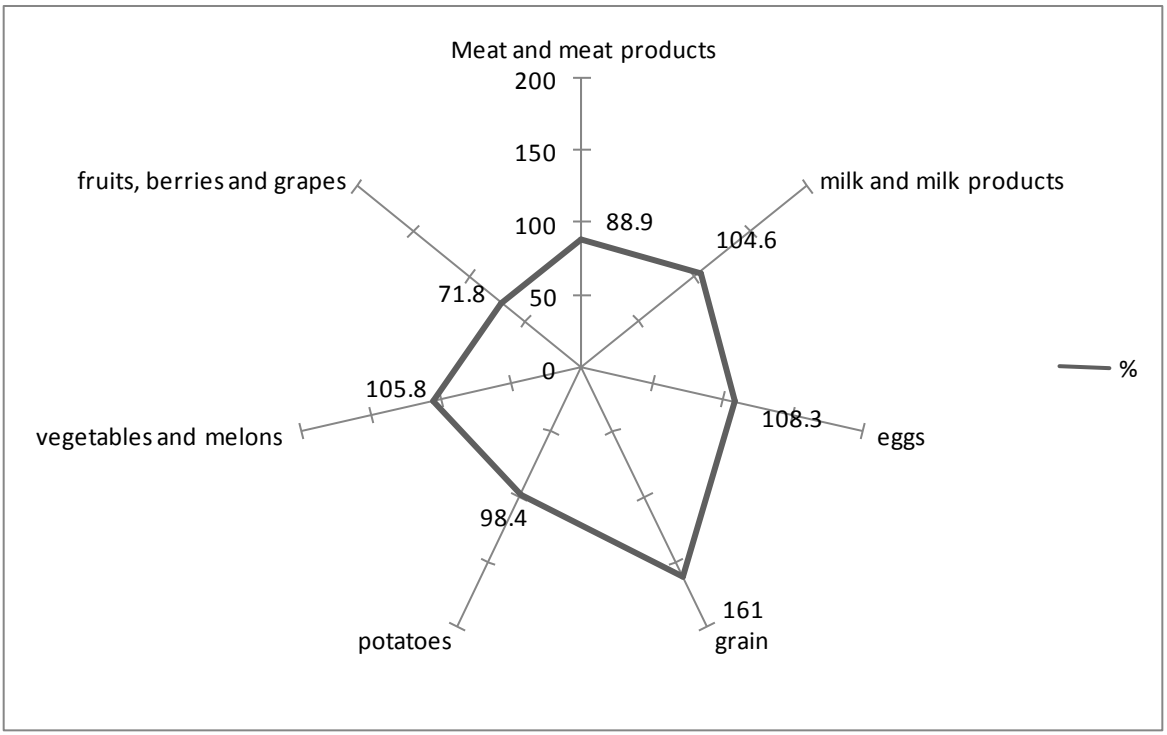

Figure 1. Level of self-sufficiency with basic types of food in 2012

Figure 1 shows that in the country the possibility of providing meat and meat products as well as fruits, berries and grapes is connected mainly with import. For example, for meat it is 17.1 % to consumption fund, and for fruit and berries it is almost a half, ie 48.1 %.

Considering defined major correlations the prospects of providing the population with basic food products can be estimated, taking into account both averaged consumption standards and consumption levels in industrialized countries.

The first stage aims at development of forecast estimations of consumption funds of basic food products on the basis of the tendencies of their change prevailing in 2000-2012 (Table. 6).

Among almost all presented food products actual and forecast estimations of average consumption (per 1 person) are much lower than nutrition standards, but at the same time, its calorific value for the past seven years (2005-2012) is 2920-2990 kcal, which is almost 200 kcal more than its standard value of 2790 kcal.

Proper production and import levels for ensuring given consumption standards or their correspondence to the level in industrialized countries require development of target (or standard) forecasting.

Considering the future population size of the country, estimated to reach 45.0 million people in 2015, and 44.4 million people in 2018, consumption fund of meat and meat products shall be as follows:

3,500 thousand tons for providing consumption standards in 2015, in which case according to balance correlation for 2012, 615.6 thousand tons can comprise import and 3210.5 thousand tons can be of domestic production;

for providing consumption at the level of industrialized countries consumption fund should be 4320 thousand tons with necessary import of 738.7 thousand tons and production of 3852.6 thousand tons.

At the same time, according to the results of the research forecasting (Table 4) meat production levels in 2015 may be at 2494 thousand tons, which makes up only 69.3 % of the need for providing nutrition standards. The deficit of production levels can be compensated in two ways: either by increasing import or by improving sector productivity and increasing meat and meat products production in the country. Similar calculations for basic types of food were done for 2015 and 2018 (Table 7).

Table 6.

Consumption funds of basic food products and their consumption standards

Year	Meat and meat products		Milk and milk products		Eggs		Grains, legumes		Potatoes		Vegetables and gourds		Fruits, berries, grapes		Sugar		Oil		Fish and fish products	
	thousand tons	kg per person	thousand tons	kg per person	thousand pieces	pieces per person	thousand tons	kg per person	thousand tons	kg per person	thousand tons	kg per person	thousand tons	kg per person	thousand tons	kg per person	thousand tons	litres per person	thousand tons	kg per person
2012 (fact)	2478	54.4	9797	214.9	810	307		109.4	6394	140.2	7452	163.4	2432	53.3	1713	37.6	591	13.0	620.1	13.6
Forecast for																				
2015	2935.9	65.2	7138.3	156.9	982.5	383	4990	90.2	7330	162.9	11343.1	252.1	3519	78.2	1431.5	31.8	325	7.2	499	11.1
2018	3111.8	70.1	5745.7	129.4	1044.8	407.8	4061.3	82.6	8050.2	181.3	13518.4	304.5	4074.4	91.8	1264.7	28.5	134	3.0	450.8	10.2
Consumption standards (average)		80		330		260	3665.5	277		260		301		175		26		13		21
Consumption in industrialized countries		96		217				158						63		32		22		

Table 7.

Forecast production levels of basic products for providing nutrition standards

Forecast estimations	Meat		Milk		Grains and legumes		Potatoes		Vegetables and gourds		Fruits, berries and grapes	
	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018
Production, thousand tons	2494.0	3121.0	11090	10810	58800	71500	27300	31300	11200	13470	2270	2500
Production need for providing:												
- consumption standards	3600	3552	17245.3	17015.6	86589	85434.8	42543.5	41976.3	19656.5	19394.4	7981.3	7874.9
- relevant consumption in industrialized countries	4320	4262	11340.1	11188.9	49390.3	48731.8	-	-	-	-	2873.3	2835.0
Additional need (+, -) for providing nutrition standards, thousand tons	-1106	-431	-6155.3	-6205.6	-27789.0	-13934.8	-15243.5	-10676.3	-8456.5	-5924	-5711.3	-5374.9
Relative estimation of additional need,%	-30.7	-12.1	-35.7	-36.5	-32.1	-16.3	-35.83	-25.4	-43.0	-30.5	-71.6	-68.25

The value of additional production need for 2018 is determined primarily by decrease in total population size of the country.

To provide possibility of meat and meat products consumption at levels of industrialized countries production levels, e.g. for 2015, should be 1.73 times more than forecast estimation for 2015, which is nowadays impossible to reach without tripled levels of import. Significant deficit can emerge under conditions of providing nutrition standards with milk and milk products: it comprises almost 35.7 % of the possible production in 2015, and 36.5 % respectively in 2018. However, special attention should be paid to the significant difference between milk consumption in our country and industrialized countries, where consumption level is almost the same as in Ukraine in 2012: it is 113 kg lower than the standard, which is the result of different nutrition culture and level. As the above calculations suggest, among all basic food products, with retaining farm management conditions currently prevailing in agricultural production, there hardly is a possibility to provide average nutrition standards. In 2015 the deficit of domestic production almost in all food groups will be more than 30-40 %, and for fruits, berries and grapes the figure will be over 70 %.

Discussion and Conclusions. Suggested analytical subsystem, which characterizes the state of provision of basic food products through domestic production in the nearest future as the basis for food security, demonstrates the need for creating a strategy of agriculture development, associated mainly with transition to the new modern development model, which will ensure its productivity and efficiency growth.

It should be noted, that an integral part of the national security of Ukraine and an important factor of its independence is food security. However, taking into consideration global trends in the world food markets and economic crisis, food availability exacerbated this problem even further. As a result, there was a decrease in purchasing power of most part of Ukrainian population and relative increase in food expenditures in household budgets. In addition, in Ukraine technological mechanism of land use, protection from soils erosion and other kinds of soil

degradation has been greatly destroyed. That is why, land relations reformation and agricultural enterprises restructurisation require new methods of overcoming the environmental stress in agriculture and termination of degradation processes.

Thus, the main problem that must be solved in order to provide food security is wide implementation of low-cost and competitive technologies for increasing agricultural production. Such measures enable to reduce the impact of both internal and external factors of security.

The main focus area on the first stage should be carrying out the agrarian reform and providing a simple reproduction, and on the second stage it is the formation of economic background for the expanded reproduction of products for domestic and export needs.

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